

## SEQUENCE LISTING



27 AUG 2001

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Tanaka, Sachiko  
Inagaki, Yoshishige

<120> Genes Encoding Proteins Regulating the pH of Vacuoles

<130> 001560-397

<140> 09/830,123

<141> 2001-04-24

<150> PCT/JP00/05722

<151> 2000-08-24

<150> JP 11/236800

<151> 1999-08-24

<160> 20

<170> PatentIn version 3.1

<210> 1

<211> 2237

<212> DNA

<213> Ipomoea nil

<220>

<221> misc\_feature

<222> (1)..(2237)

<223> Nucleotide sequence of DNA encoding for protein regulating the pH of vacuoles

<400> 1

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atg gcg ttc ggg ttg tct tct ttg ctc caa aat tcg gat ttg ttc acg    347
Met Ala Phe Gly Leu Ser Ser Leu Leu Gln Asn Ser Asp Leu Phe Thr
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gaa gat ctt ttc ttt ata tat ctc ctg cca cct ata ata ttc aat gcg	587
Glu Asp Leu Phe Phe Ile Tyr Leu Leu Pro Pro Ile Ile Phe Asn Ala	
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ggg ttt caa gtg aaa aag aag cag ttt ttc gtg aac ttc atg aca att	635
Gly Phe Gln Val Lys Lys Lys Gln Phe Phe Val Asn Phe Met Thr Ile	
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Phe Gly Ala Val Lys Ile Phe Lys His Leu Asp Ile Asp Phe Leu Asp	
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Val Cys Thr Leu Gln Val Leu Ser Gln Asp Glu Thr Pro Leu Leu Tyr	
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Ser Leu Val Phe Gly Glu Gly Val Val Asn Asp Ala Thr Ser Val Val	
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Leu Phe Asn Ala Ile Gln Ser Phe Asp Met Thr Ser Phe Asp Pro Lys	
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Phe	Ala	Thr	Leu	Ser	Phe	Val	Ala	Glu	Thr	Phe	Ile	Phe	Leu	Tyr	Val		
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 145 150 155 160  
 Val Cys Thr Leu Gln Val Leu Ser Gln Asp Glu Thr Pro Leu Leu Tyr  
 165 170 175  
 Ser Leu Val Phe Gly Glu Gly Val Val Asn Asp Ala Thr Ser Val Val  
 180 185 190  
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 Ser Gly Ile Leu Thr Val Phe Phe Cys Gly Ile Val Met Ser His Tyr  
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 Gly Met Asp Ala Leu Asp Ile Glu Lys Trp Lys Phe Val Lys Asn Ser  
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 Ala Lys Lys Asn Ser Ser Asp Lys Ile Ser Phe Arg Gln Gln Ile Ile  
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 385 390 395 400  
 Tyr Asn Lys Phe Thr Thr Ser Gly His Thr Ser Leu His Glu Asn Ala  
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Ile Met Ile Thr Ser Thr Val Thr Val Val Leu Phe Ser Thr Val Val  
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Phe Gly Leu Met Thr Lys Pro Leu Ile Asn Leu Leu Leu Pro Pro His  
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17

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 Asp His Gln Ser Val Val Ser Ile Asn Leu Phe Val Ala Leu Ile Cys  
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 Glu Ser Ile Thr Ala Leu Val Ile Gly Ser Cys Thr Gly Ile Val Ile  
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 Asp Leu Phe Phe Ile Tyr Leu Leu Pro Pro Ile Ile Phe Asn Ala Gly  
 85 90 95  
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135 140 145	
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Trp His Asn Val Thr Glu Ser Ser Arg Val Thr Thr Lys His Thr Phe	
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Ala Thr Leu Ser Phe Ile Ala Glu Ile Phe Ile Phe Leu Tyr Val Gly	
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 aat cag ttt acc agg gga ggt cat act cag tta cgc gca aat gca ata 1605  
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 Ser His Thr Val His Tyr Tyr Trp Arg Lys Phe Asp Asn Ala Phe Met  
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 Met Asn Glu Ser Ile Thr Ala Leu Val Ile Gly Ser Cys Thr Gly Ile  
                           50                          55                          60  
 Val Ile Leu Leu Ile Ser Gly Gly Lys Asn Ser His Ile Leu Val Phe  
                           65                          70                          75                          80  
 Ser Glu Asp Leu Phe Phe Ile Tyr Leu Leu Pro Pro Ile Ile Phe Asn  
                           85                          90                          95  
 Ala Gly Phe Gln Val Lys Lys Lys Ser Phe Phe Arg Asn Phe Ser Thr  
                           100                          105                          110  
 Ile Met Leu Phe Gly Ala Leu Gly Thr Leu Ile Ser Phe Ile Ile Ile  
                           115                          120                          125  
 Ser Leu Gly Ala Ile Gly Ile Phe Lys Lys Met Asn Ile Gly Ser Leu  
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 Glu Ile Gly Asp Tyr Leu Ala Ile Gly Ala Ile Phe Ser Ala Thr Asp  
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 Tyr Ser Leu Val Phe Gly Glu Gly Val Val Asn Asp Ala Thr Ser Val  
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Val Leu Phe Asn Ala Ile Gln Asn Phe Asp Leu Ser His Ile Asp Thr  
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 Gly Lys Ala Met Glu Leu Val Gly Asn Phe Leu Tyr Leu Phe Ala Ser  
 210 215 220  
 Ser Thr Ala Leu Gly Val Ala Ala Gly Leu Leu Ser Ala Tyr Ile Ile  
 225 230 235 240  
 Lys Lys Leu Tyr Phe Gly Arg His Ser Thr Asp Arg Glu Val Ala Ile  
 245 250 255  
 Met Ile Leu Met Ala Tyr Leu Ser Tyr Met Leu Ala Glu Leu Phe Tyr  
 260 265 270  
 Leu Ser Ala Ile Leu Thr Val Phe Phe Ser Gly Ile Val Met Ser His  
 275 280 285  
 Tyr Thr Trp His Asn Val Thr Glu Ser Ser Arg Val Thr Thr Lys His  
 290 295 300  
 Thr Phe Ala Thr Leu Ser Phe Ile Ala Glu Ile Phe Ile Phe Leu Tyr  
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 Val Gly Met Asp Ala Leu Asp Ile Glu Lys Trp Lys Phe Val Ser Asp  
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 Ser Pro Gly Ile Ser Val Gln Val Ser Ser Ile Leu Leu Gly Leu Val  
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 Thr Ile Trp Trp Ala Gly Leu Met Arg Gly Ala Val Ser Met Ala Leu  
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 Ala Tyr Asn Gln Phe Thr Arg Gly Gly His Thr Gln Leu Arg Ala Asn  
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 Ala Ile Met Ile Thr Ser Thr Ile Thr Val Val Leu Phe Ser Thr Val  
 420 425 430  
 Val Phe Gly Leu Met Thr Lys Pro Leu Ile Arg Ile Leu Leu Pro Ser  
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 His Lys His Leu Ser Arg Met Ile Ser Ser Glu Pro Thr Thr Pro Lys  
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 Ser Phe Ile Val Pro Leu Leu Asp Ser Thr Gln Asp Ser Glu Ala Asp  
 465 470 475 480  
 Leu Glu Arg His Val Pro Arg Pro His Ser Leu Arg Met Leu Leu Ser  
 485 490 495

Thr Pro Ser His Thr Val His Tyr Tyr Trp Arg Lys Phe Asp Asn Ala  
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<210> 16

<211> 2553

<212> DNA

<213> Nierembergia hybrida

<220>

<221> misc\_feature

<222> (1)..(2553)

<223> Nucleotide sequence of DNA encoding for protein regulating the  
pH of vacuoles

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tcgtcttctc aatctgcttt caaatccttt ttgtttgtga tattcgatat tattcactca 180

gtttacotta atatttcttc gcactttctg aattcgagtg ctttgaagtg tgttggattt 240

cgaaaagcgg aagaaaattc agcaaaaacg ctgttgctga atttgcagca gtttgagttt 300

ttgctaaata gctaagatct gattgaattt ttactgggtg cttataggga aattcgacgt 360

cgttttgact gcaatatattg tccgtgattc ggactttggt gaaattttgc tatttgaaat 420

ttgaatgtaa gggtgtcata gctttgccac tcggaaatac agtcagtgag aaagaaaaaa 480

aactgtgtag tgttttttcc acaagtattt ggtgaattga ggttcttgaa atg gcg 536  
Met Ala

ttt gac ttt ggg act ctg ctg gga aag atg aac aac tta aca act tct 584

Phe Asp Phe Gly Thr Leu Leu Gly Lys Met Asn Asn Leu Thr Thr Ser  
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gat cat caa tca gtg gtg tcg gta aac ttg ttt gtt gca ctt att tgc 632

Asp His Gln Ser Val Val Ser Val Asn Leu Phe Val Ala Leu Ile Cys  
20 25 30

gcg tgt att gtg atc ggt cat tta ttg gag gaa aac aga tgg atg aat 680

Ala Cys Ile Val Ile Gly His Leu Leu Glu Glu Asn Arg Trp Met Asn  
35 40 45 50

gag tcc ata act gcc ctt gtg att ggt agt tgc act gga gtc atc att 728

Glu Ser Ile Thr Ala Leu Val Ile Gly Ser Cys Thr Gly Val Ile Ile  
55 60 65

cta cta ata agt gga gga aag aac tca cat att tta gtg ttc agc gaa	776
Leu Leu Ile Ser Gly Gly Lys Asn Ser His Ile Leu Val Phe Ser Glu	
70 75 80	
gat ctt ttc ttc att tac ctt ctt cca ccg atc att ttt aat gct ggg	824
Asp Leu Phe Phe Ile Tyr Leu Leu Pro Pro Ile Ile Phe Asn Ala Gly	
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Phe Gln Val Lys Lys Lys Ser Phe Phe Arg Asn Phe Ser Thr Ile Met	
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Leu Phe Gly Ala Val Gly Thr Leu Ile Ser Phe Ile Ile Ile Ser Ala	
115 120 125 130	
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Gly Ala Ile Gly Ile Phe Lys Lys Met Asp Ile Gly His Leu Glu Ile	
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Phe Asn Ala Val Gln Asn Phe Asp Leu Ser His Ile Ser Thr Gly Lys	
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Phe Leu Gly Val Ala Val Gly Leu Leu Ser Ala Phe Ile Ile Lys Lys	
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Leu Tyr Phe Gly Arg His Ser Thr Asp Arg Glu Val Ala Ile Met Ile	
245 250 255	
ctc atg gcg tac cta tca tac atg ctt gct gaa tta ttc tat tta agt	1352
Leu Met Ala Tyr Leu Ser Tyr Met Leu Ala Glu Leu Phe Tyr Leu Ser	
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Gly Ile Leu Thr Val Phe Phe Cys Gly Ile Val Met Ser His Tyr Thr	
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Ala	Thr	Leu	Ser	Phe	Ile	Ala	Glu	Ile	Phe	Ile	Phe	Leu	Tyr	Val	Gly		
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Met	Asp	Ala	Leu	Asp	Ile	Glu	Lys	Trp	Lys	Phe	Val	Ser	Asp	Ser	Pro		
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Gly	Thr	Ser	Ile	Lys	Val	Ser	Ser	Ile	Leu	Leu	Gly	Leu	Val	Leu	Val		
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Gly	Arg	Gly	Ala	Phe	Val	Phe	Pro	Leu	Ser	Phe	Leu	Ser	Asn	Leu	Thr		
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Lys	Lys	Asn	Pro	Glu	Asp	Lys	Ile	Ser	Phe	Asn	Gln	Gln	Val	Thr	Ile		
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tgg	tgg	gct	ggg	ctt	atg	cga	ggc	gct	gtt	tct	atg	gcc	ctt	gct	tat	1736	
Trp	Trp	Ala	Gly	Leu	Met	Arg	Gly	Ala	Val	Ser	Met	Ala	Leu	Ala	Tyr		
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Asn	Gln	Phe	Thr	Arg	Gly	Gly	His	Thr	Gln	Leu	Arg	Ala	Asn	Ala	Ile		
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Met	Ile	Thr	Ser	Thr	Ile	Thr	Val	Val	Leu	Phe	Ser	Thr	Val	Val	Phe		
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cac	ttg	atc	aga	atg	atc	tcc	tct	gaa	ccg	atg	act	cca	aaa	tcc	ttc	1928	
His	Leu	Ile	Arg	Met	Ile	Ser	Ser	Glu	Pro	Met	Thr	Pro	Lys	Ser	Phe		
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Arg	His	Val	Pro	Arg	Pro	His	Ser	Leu	Arg	Met	Leu	Leu	Ser	Thr	Pro		
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Ser	His	Thr	Val	His	Tyr	Tyr	Trp	Arg	Lys	Phe	Asp	Asn	Ala	Phe	Met		
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Arg	Pro	Val	Phe	Gly	Gly	Arg	Gly	Phe	Val	Pro	Phe	Val	Pro	Gly	Ser		



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cct act gaa ccg gtc gaa ccg acc gaa cca aga cca gcc gaa tca aga 2168
Pro Thr Glu Pro Val Glu Pro Thr Glu Pro Arg Pro Ala Glu Ser Arg
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cca acc gaa cca act gat gag tgattacact gatggagatg caggttgac 2219
Pro Thr Glu Pro Thr Asp Glu
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actgttaata gttttcgaat gtggttaaaa aagggttgtc tagtttttat atataggtcg 2339
cagatacgta atttcagctc agttcccag gtgaaccctt tagaggtttt cttcctgacg 2399
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<213> Nierembergia hybrida

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<223> Amino acid sequence of protein regulating the pH of vacuoles

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Ile Cys Ala Cys Ile Val Ile Gly His Leu Leu Glu Glu Asn Arg Trp
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Met Asn Glu Ser Ile Thr Ala Leu Val Ile Gly Ser Cys Thr Gly Val
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Ile Ile Leu Leu Ile Ser Gly Gly Lys Asn Ser His Ile Leu Val Phe
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Ser Glu Asp Leu Phe Phe Ile Tyr Leu Leu Pro Pro Ile Ile Phe Asn
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Ala Gly Phe Gln Val Lys Lys Lys Ser Phe Phe Arg Asn Phe Ser Thr
          100          105          110

Ile Met Leu Phe Gly Ala Val Gly Thr Leu Ile Ser Phe Ile Ile Ile

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Ser	Val	Cys	Thr	Leu	Gln	Val	Leu	Asn	Gln	Glu	Glu	Thr	Pro	Leu	Leu
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Tyr	Ser	Leu	Val	Phe	Gly	Glu	Gly	Val	Val	Asn	Asp	Ala	Thr	Ser	Val
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Val	Leu	Phe	Asn	Ala	Val	Gln	Asn	Phe	Asp	Leu	Ser	His	Ile	Ser	Thr
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225					230					235					240
Lys	Lys	Leu	Tyr	Phe	Gly	Arg	His	Ser	Thr	Asp	Arg	Glu	Val	Ala	Ile
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Gln Lys His Leu Ile Arg Met Ile Ser Ser Glu Pro Met Thr Pro Lys  
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Ser Phe Ile Val Pro Leu Leu Asp Ser Thr Gln Asp Ser Glu Ala Asp  
 465 470 475 480

Leu Gly Arg His Val Pro Arg Pro His Ser Leu Arg Met Leu Leu Ser  
 485 490 495

Thr Pro Ser His Thr Val His Tyr Tyr Trp Arg Lys Phe Asp Asn Ala  
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Phe Met Arg Pro Val Phe Gly Gly Arg Gly Phe Val Pro Phe Val Pro  
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Ser Arg Pro Thr Glu Pro Thr Asp Glu  
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Gly	Ser	Val	Val	Ala	Ile	Thr	Leu	Phe	Val	Thr	Leu	Leu	Cys	Thr	Cys		
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ata	gtg	att	ggg	cat	ctt	ctg	gag	gaa	aac	cgt	tgg	atg	aat	gaa	tct	557	
Ile	Val	Ile	Gly	His	Leu	Leu	Glu	Glu	Asn	Arg	Trp	Met	Asn	Glu	Ser		
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Ile	Ile	Ala	Leu	Ile	Ile	Gly	Leu	Ala	Thr	Gly	Val	Ile	Ile	Leu	Leu		
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Phe	Phe	Ile	Tyr	Ala	Leu	Pro	Pro	Ile	Ile	Phe	Asn	Ala	Gly	Phe	Gln		
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Gln	Val	Leu	Ser	Gln	Asp	Glu	Thr	Pro	Leu	Leu	Tyr	Ser	Leu	Val	Phe		
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Thr	Val	Phe	Phe	Cys	Gly	Ile	Val	Met	Ser	His	Tyr	Thr	Trp	His	Asn		
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cca	ctc	gaa	aaa	atc	agt	ctc	agg	cag	caa	att	ata	ata	tgg	tgg	gct	1565	
Pro	Leu	Glu	Lys	Ile	Ser	Leu	Arg	Gln	Gln	Ile	Ile	Ile	Trp	Trp	Ala		
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caa act tca caa ggt ggc gaa ccc gtt gct cga ccg agc agc cta cgc 1901
Gln Thr Ser Gln Gly Gly Glu Pro Val Ala Arg Pro Ser Ser Leu Arg
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Met Leu Leu Thr Lys Pro Thr His Thr Val His Tyr Tyr Trp Arg Lys
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Phe Asp Asn Ala Phe Met Arg Pro Val Phe Gly Gly Arg Gly Phe Val
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cca tat gtt ccc ggt tca ccg act gaa cga agc gtt cgc aac tgg gaa 2045
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Leu Trp Ser Ser Gly His Gly Ser Val Val Ala Ile Thr Leu Phe Val
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Thr Leu Leu Cys Thr Cys Ile Val Ile Gly His Leu Leu Glu Glu Asn
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 Val Val Leu Phe Asn Ala Val Gln Asn Phe Asp Leu Pro His Met Ser  
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Asn Leu Ala Lys Lys Ser Pro Leu Glu Lys Ile Ser Leu Arg Gln Gln  
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Ile Ile Ile Trp Trp Ala Gly Leu Met Arg Gly Ala Val Ser Met Ala  
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